Grazing for Good: Evidence review of *Grazing Regimes for Nature Recovery*

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Introduction

This report was commissioned as part of the Grazing for Good project, initiated by the Federation of Cumbria Commoners, Herdwick Sheep Breeders' Association, and West Lakeland CIC. These three local organisations instigated this work following changes to stocking levels in Higher Level Stewardship rollover agreements, commencing in 2020, which they understood were based upon recommendations of the Grazing Regimes for Nature Recovery (GRNR) report, published in June 2020. The Herdwick Sheep Breeders' Association subsequently crowdsourced almost £10,000 from local businesses and small organisations in order to better understand the evidence being used to negotiate stocking rates. They commissioned Professor Robin Pakeman of James Hutton Institute, to conduct an initial scoping review of the GRNR report, and to provide recommendations for future research and collaboration to improve how land management decisions by stakeholders on the high Lake District fells consider both ecosystem condition and local farming systems. Professor Pakeman[1] made three key recommendations in his initial review based upon the Ecosystem Approach.

The Ecosystem Approach was adopted as the primary framework for action under the Convention on Biological Diversity (CBD) under the Conference of the Parties (COP). The Ecosystem Approach is a strategy for integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way.

It acknowledges that ecosystems encompass processes, functions and interactions among organisms and their environment and that humans are an integral component of many ecosystems. It also acknowledges the need for adaptive management and that uncertainties are inherent in predicting the impacts of management. The Ecosystem Approach was adopted within Defra/NE's National Upland Outcomes framework.[2]

Following the twelve principles of the Ecosystem Approach, three steps for progress to an agreed framework for management decisions in the Lake District were suggested from Professor Pakeman's initial review:

1. *Independent Facilitation: All stakeholders to come together with an independent facilitator to scope out how to review the available evidence.*
2. *Independent scientific panel: An independent panel of scientists appointed to review evidence on environment, economics, and social aspects to understand the drivers of change and to identify potential directions for upland management that would deliver multiple benefits.*
3. *Decision making framework: The stakeholders to agree a framework for future management decision making within the Lake District taking into account all drivers of change and specific socio-economic circumstances in the area.*

To begin implementing Professor Pakeman's recommendations, the consortium of local organisations partnered with the National Sheep Association (NSA) to undertake project management and assist in obtaining wider funding for the project. The next steps of the project were subsequently enabled through funding from the Lake District National Park's Farming in Protected Landscape (FIPL) programme, and from the NSA Northern Region. To secure FIPL funding, a steering group was established, and this process has been detailed in the annex of this report.

Background

The Lake District has long held a complex place in Britain's cultural imagination. Daniel Defoe described it as "the wildest, most barren and frightful of any that I have passed over in England"[3]. However, subsequent generations of artists, writers and many visitors reframed the region as a landscape of exceptional visual and cultural value. This importance underpinned the region's protection as a National Park since 1951, and the Lake District's inscription as a UNESCO World Heritage Cultural Landscape in 2017.

The World Heritage Committee's statement emphasises that this status rests not only on natural beauty but on a continuing system of land use: "The Lake District's continuing distinctive agro-pastoral traditions based on local breeds of sheep including the Herdwick, on common fell-grazing and relatively independent farmers"[4]. The Committee concluded that the area's "harmonious beauty" is rooted in the interaction between an agro-pastoral land-use system and its dramatic natural setting, and that the landscape's patterning across valleys and fells is a product of these long-standing practices.

International expert assessment has reflected similar reasoning. The International Council on Monuments and Sites (ICOMOS), one of the key advisors for World Heritage Committees, observed that "the most defining feature of the region, which has deeply shaped the cultural landscape, is a long-standing and continuing agro-pastoral tradition," and noted how settlement patterns and grazing systems recorded over centuries explain how the land has been used[5].

Hill farming, and sheep grazing on commons and high fells, have been central both to the Lake District's physical form and to the social and cultural practices that sustain it. At the same time, the Lake District's public image can risk obscuring this role. There is a possibility that failure to recognise the role of fell farming risks not only ecological change but also loss of cultural practices and livelihoods[6].

William Wordsworth, an internationally recognised poet who inspired much of the British romantic movement, said that the Lake District should be considered "a sort of national property, in which every man has a right and interest who has an eye to perceive and a heart to enjoy". This sentiment was taken forward by John Muir, often known as the father of conservation, as inspiration for the protected areas in the United States, and in later years the conservation movement

In the 1947 Report of the National Parks Committee (known as the Hobhouse Report)[7], which considered the Establishment of the initial locations of Britain's first National Parks, the Lake District was described thus:

> "The beauty of the valleys is intricate and surprisingly close packed. The lake shores are "all nabs and neuks", the trees and woodlands above them are a natural mosaic in spring or autumn, and the streams a succession of clear pools and rapids in which no two stretches are alike. Even in the Lake District, the hand of man has greatly contributed to the beauty and harmony of the landscape. A thousand years ago the Norsemen began to clear and drain the valleys. They and their descendants carried the great stones off the land, built the field walls and fenced in the flooding torrents.
>
> The intricate pattern of the green fields, the long low farmsteads, modestly offering no challenge to the crags above, the lanes and footpaths, the unpretentious churches, the shorthorn cattle and the Herdwick sheep still show how much this landscape owes to the " statesmen" or yeomen farmers of succeeding centuries. The same fine stock of men is here still. They graze their sheep on the highest mountains all through the winter and win their hay in the valleys in any fine spell from June to October.[8]

The creation of the Lake District National Park in 1951 was aimed at both preserving the landscape and making it accessible to all. The Park Authorities were given responsibility for social and economic aspects of the Parks primarily through planning control[9]. At the time, the 'cultural' aspects of the landscape were not otherwise in the remit of the National Park, although recognition of the cultural making of the landscape has increasingly been recognised by all National Parks in the UK. One of the key concerns of the Hobhouse Report was that commercial forestry in the Lake District would jeopardise many of the Lake District's unique qualities:

> "Conifer planting was branded by Wordsworth as an abominable kind of "vegetable manufactuary" and there is no doubt that conifers, as they have usually been planted, in large blocks of one species and age-group, change the whole character of the countryside, and destroy its natural plant and animal life. Their sombre uniformity, the hard edges where they meet the natural hillsides, and their general air of regimentation, are always out of harmony with the landscape of this country. There should certainly not be much more conifer planting within the Lake District, and new plantations should be, so far as possible, adapted to their setting."

The report goes on to highlight how the risk of commercial forestry was simultaneously a threat to the landscape the committee sought to protect, and the existing hill farming systems present in the fells:

> "In this matter the interests of landscape beauty and of the gravely threatened Herdwick sheep industry are identical. Already famous flocks in Ennerdale and the Duddon Valley and near Thornthwaite have been eliminated by the afforestation of the intakes, and within the past year another has been doomed."[10]

The Lake District's World Heritage Site status is, therefore, an important part of the context for understanding the cultural, historical and farming significance of the high fells. However, World Heritage

designation is not the same kind of instrument as the statutory ecological designations that apply across many of the same landscapes. Much of the high fell landscape is also covered by Sites of Special Scientific Interest (SSSIs), and by the Lake District High Fells Special Area of Conservation (SAC), which form part of the statutory framework for protecting habitats and species of national and international importance. These designations sit within a wider policy context shaped by the Conservation of Habitats and Species Regulations, Environmental Improvement Plans, Local Nature Recovery Strategies, Environmental Land Management, and wider government commitments to halt biodiversity decline and restore ecological function. Subsequent legislation and policy have further clarified that National Park purposes encompass the conservation and enhancement of natural beauty, wildlife and cultural heritage, alongside a duty to seek to foster the economic and social wellbeing of local communities.

The Lake District High Fells SAC covers a complex upland mosaic, including dry heath, wet heath, alpine and boreal heaths, montane acid grassland, blanket bog, tall herb communities, juniper, western acidic oak woodland, upland tarns, crags and screes. The conservation objectives for the SAC require the integrity of the site to be maintained or restored so that it contributes to the favourable conservation status of its qualifying features, including their extent, distribution, structure, function, typical species and supporting ecological processes. In this context, Natural England has statutory responsibilities for protected-site assessment and reporting, but its role is broader than enforcement or designation protection alone. Natural England is also an environmental delivery body and statutory adviser, with responsibilities for evidence use, agri-environment advice, monitoring, farmer engagement and the negotiation of management approaches intended to secure environmental outcomes while working with land managers.

The Lake District high fells are not simply a cultural landscape, nor simply a collection of protected ecological features. They are a working upland farming landscape in which statutory nature recovery obligations, public benefits, agricultural systems, common rights, cultural heritage and local livelihoods overlap. Any assessment of GRNR, stocking-rate advice and agri-environment agreement design therefore needs to recognise both the legal requirement to restore designated habitats and the practical need for transparent, evidence-based, trusted and workable decision-making with farmers and commoners.

As well as a cultural landscape, the Lake District thus holds a range of habitats of conservation importance. In consequence, many areas of the fells have been designated as Sites of Special Scientific Interest (SSSI) or Special Areas of Conservation (SAC). That designation means that management has to be tailored to maintain or shift these sites to favourable condition. Natural England is the body responsible for assessing habitat condition and negotiating agri-environment and other agreements aimed at ensuring that these designated sites are in favourable condition.

The Lake District High Fells SAC was designated on 1 April 2005, covers 26,999.36 ha, and is made up of ten component SSSIs: Armboth Fells, Birk Fell, Buttermere Fells, Helvellyn and Fairfield, Honister Crag, Pillar and Ennerdale Fells, Scafell Pikes, Shap Fells, Skiddaw Group and Wasdale Screes. The SAC citation describes an upland site on acidic rocks, with dry heath, wet heath, blanket bog, alpine and boreal heaths, montane acidic grasslands, crags, screes, tall herb ledges, juniper, western acidic oak woodland and upland tarns.[11] The SAC conservation objectives require the site's integrity to be maintained or restored, including the extent, distribution, structure and function of qualifying habitats and species, their supporting processes, and the populations and distribution of qualifying species.[12]

The Site Improvement Plan identifies 'inappropriate grazing' as a first priority issue, with the measure to 'review grazing regimes and negotiate alterations where necessary for site condition,' but also identifies other pressures including deer, atmospheric nitrogen deposition, public access/disturbance, managed rotational burning, hydrological change, invasive species and disease. The plan states that, in recent times, sheep grazing has had 'by far the biggest man-made impact' on almost all SAC features, while also recognising localised pressure, seasonality, and potential benefits from cattle in some locations.[13]

England's current Environmental Improvement Plan is described by the government as the framework for improving England's natural environment up to 2043, with interim targets for statutory Environment Act targets.[14] Local Nature Recovery Strategies are another statutory requirement under the Environment Act 2021,

and are intended to be locally led, with public, private and voluntary sectors agreeing priorities for nature recovery. The Conservation of Habitats and Species Regulations (2017) remain the key regulatory framework for SACs and SPAs in England.

The Lake District's High Fells SAC includes several key habitat types, and in our conversations with Natural England they have highlighted that the heath habitats (as opposed to Bog areas which sheep tend not to favour) and the alpine vegetation communities are the most vulnerable. The High Fells' SAC Citation describes these areas thus:

- This upland site is predominantly on acidic rocks, of the Borrowdale Volcanic Series and Skiddaw Slates. Dry heath occurs throughout with heather *Calluna vulgaris* and locally bilberry *Vaccinium myrtillus* being the dominant species. Wet heath, which occurs throughout the complex in a mosaic with other habitats, is dominated by heather, with cross-leaved heath *Erica tetralix* and bog-moss *Sphagnum* species.
- Alpine and Boreal heaths and montane acidic grasslands form an important component at higher altitudes. Heather, *Calluna vulgaris* can be a significant component but dies out at the highest altitudes. Wavy hair-grass *Deschampsia flexuosa* and sheep's fescue *Festuca ovina* can dominate the sward, with bilberry, woolly fringe-moss *Racomitrium lanuginosum*, stiff sedge *Carex bigelowii*, fir clubmoss *Huperzia selago* and lichens. Dwarf willow *Salix herbacea* and alpine clubmoss *Diphasiastrum alpinum* can be locally abundant, the latter particularly where there is late snow-lie.

Grazing Regimes for Nature Recovery

Grazing Regimes for Nature Recovery (GRNR)[15] was a report published by the local Natural England (NE) Team in 2020 to inform farmers about the unique habitats found in SSSI's and SAC's in the Lake District and to describe how their observations of sheep grazing on these unique habitats have led them to conclusions about the best stocking levels for the fells. The GRNR report seeks to answer questions that NE staff had been asked when working with farmers on agreements (an appendix specifically lists questions previously raised by farmers).

> The report itself states that GRNR was "written primarily to help local farmers and partner organisations to understand Natural England's work related to grazing in the Lake District's high fells."[16] The report is therefore detailed as a descriptive account of local NE staff's previous experiences of what works and what doesn't with regards to the relationship between grazing densities and nature recovery.

However, there was no direct involvement of farmers in designing or delivering the report. It is the view held by local farmers and commoners that GRNR has become a de facto contemporary local policy instrument in recent Higher Level Stewardship rollover agreements in the region, as it provides the most visible documented synthesis repeatedly cited in correspondence reviewed by the panel for setting stocking levels in the new agreements. This has been demonstrated in correspondence from NE to agreement holders, stating that:

> "Natural England has proposed a phased stocking reduction, based on the survey results and our evidence base as detailed in the Grazing Regimes for Nature Recovery Report (2020)", that the GRNR "report has been used as the basis for management changes in HLS agreements across the Lakes," and that "the evidence we use in our consistent approach to securing the delivery of environmental objectives under agri-environment schemes in the Cumbria uplands is as detailed in the Grazing Regimes report" and that stocking levels were proposed based on "the ideal rate evidenced in our Grazing Regimes report"[17]

At a public meeting hosted by the National Trust about their 'future farming programme' on 27th February 2020, farming stakeholders have recalled and research fieldnotes reflect that a member of the local Natural England Team on a panel stated that an annual stocking rate of half a ewe per hectare would be used in the upcoming Higher Level Stewardship (HLS) rollovers across the region, and that this recommendation was based on a new report from the local NE team (GRNR report). This event led to intense discussion as agreements in HLS rollovers were negotiated with NE. As a result of this, farming bodies in the Lake District sought the advice of independent experts on the validity of this approach and of the evidence underpinning it. NE contests aspects of this account and notes that GRNR had not yet been published at that date. Nonetheless, it is accurate to state that the

meeting contributed to a perception, subsequently reinforced by correspondence citing GRNR, that the 0.5 annual-average reference point would shape rollover negotiations.

The project team was provided with the above correspondence in which GRNR was cited as an important evidence base for proposed stocking changes. NE states, however, that GRNR is not the sole evidence base for agreement advice, which is also informed by site-specific surveys, condition assessments, advisor observation, professional judgement and peer review. This review can therefore assess how GRNR presents and supports its conclusions, but it cannot, without fuller case-study evidence, determine the full evidential basis for individual agreement decisions.

Natural England's role in land management and approaches to evidence

SSSI monitoring is part of NE's statutory responsibility to conserve and protect SSSIs. Its objectives include providing evidence to support site management, giving feedback to land managers, assessing interventions, supporting protected-site responsibilities, contributing to long-term environmental monitoring, and supporting regulatory/enforcement responsibilities. NE uses Common Standards Monitoring (CSM) alongside methods such as earth observation, partner and third-party data, DNA evidence, land-manager and volunteer data, rapid targeted assessments and site checks; SSSI units are used to connect feature condition with risks, remedies and management relevant to particular parts of a site.

Natural England's SSSI Monitoring and Assessment standard requires feedback to land managers and owners, publication of data/assessments, adaptation of management and review of targets, stating that good, timely feedback to land managers on NE's monitoring and assessments is essential, and should normally be provided within 28 days, and that monitoring and assessment may prompt NE to discuss and seek changes in site management so that features reach and remain in favourable condition.[18]

NE's 2024-2025 Agri-Environment Evidence Annual Report describes AES as schemes that encourage farmers and landowners to protect and enhance the environment by paying agreement holders for environmental services, including historic features and landscape character. It identifies SFI, Countryside Stewardship Higher Tier and Landscape Recovery as the three primary ELM schemes, while also noting that HLS agreements remain live in some places. The Agri-Environment Evidence Programme, which monitors and evaluates England's AES, is managed by NE on behalf of Defra, and includes work on scheme effectiveness, design/delivery, and public perceptions/farmer engagement. NE's role is therefore not only regulatory, it also involves evidence generation, monitoring, evaluation, agreement design, advice and support.

Natural England's Evidence Standard states that the organisation depends on 'sound, quality-assured evidence' as both an environmental delivery organisation and statutory adviser. NE requires advice and decisions to be underpinned by best available evidence, quality assured to the correct level, with the rationale and evidence supporting decisions open, transparent and recorded. It also defines evidence broadly, including biodiversity, geodiversity, soils, landscape, economic and social analysis, monitoring, peer-reviewed studies, technical reports, systematic reviews, commissioned studies, case studies, expert/practitioner opinion and customer feedback.[19]

NE's 'Analysis of Evidence Standard' is also relevant to the review, stating that evidence, analysis, conclusions and uncertainty must be appropriate to the question being addressed, and that uncertainty, gaps or competing interpretations must be clearly identified and recorded.[20] The Evidence Standard further requires evidence to be assessed for relevance, completeness, accuracy and timeliness, and requires staff to explain where missing or incomplete information constrains analysis or decision-making.[21] The Quality Management Standard applies across evidence gathering, agri-environment and advice schemes, regulatory roles and external communications, and sets out a tiered QA approach proportionate to risk.[22]

The recent Science, Evidence and Analysis Framework 2025-2030 states that: 'the quality of our advice and actions, and the legality of our decisions, fundamentally depend upon our use and understanding of the evidence base. This is also key to ensuring our decisions, advice and delivery inspire greater and bolder action to drive forward nature recovery. As an

organisation, we are committed to being powered by science.'[23] The framework's monitoring and evaluation section also commits to 'setting clearer standards and applying more robust methods to understand the impact of our interventions and make more confident, evidence-led decisions' and to 'embed evaluation from the start to generate insights, support continuous learning, and improve decision-making, all underpinned by clear governance and accountability.'[24]

Review remit

The Lakeland fells provide biodiversity, water-quality, water-flow, soil, carbon, recreation and wellbeing benefits, and these benefits are affected by multiple pressures including grazing, deer, burning, nitrogen deposition, climate, recreation and other surface disturbance. The review focuses on grazing because that is the focus of GRNR and the immediate concern in HLS rollovers, but this should not be read as implying that grazing is the only driver of condition.

This review is an independent, evidence-focused attempt to clarify how GRNR's conclusions are grounded in the available science and monitoring, and to identify how those conclusions have been applied in Lake District contexts. It seeks to be transparent and impartial while also responding to concerns voiced by local farming communities about livelihoods, heritage and the practical consequences of reductions in grazing numbers. Because this review was conducted within a limited timeframe and without a comprehensive sample of agreement case studies, conclusions about implementation should be read as identifying issues requiring further joint investigation rather than as a full audit of NE decision-making practice. The analysis therefore considers both the evidence presented in GRNR, stakeholder perceptions, and examples through which the document's recommendations have been implemented, recognising that ecological and social outcomes are intertwined in the Lake District's landscape. We seek to address two key questions in this report:

1. What is the empirical basis for the 0.5 ewe/ha [annual average] figure used in Grazing Regimes for Nature Recovery (GRNR)?
2. How has stocking rate evidence for agreements been generated, interpreted and applied on the ground in the Lake District during HLS rollovers?

A third question also outlines the review authors' recommendations, reflecting on the evidence discussed, for future opportunities to improve some of the key areas of concern for stakeholders in the region:

3. What immediate improvements to data-sharing and agreement negotiation processes would most increase confidence in decision-making for the Lake District fells?

1. What is the empirical basis for the 0.5 ewe/ha [annual average] figure used in Grazing Regimes for Nature Recovery?

The purpose of this section of the review is to examine the empirical basis for the 0.5 ewe/ha annual average stocking rate reported by GRNR as a level at which good recovery has sometimes been observed, and to assess how far that figure is supported by evidence rather than by local convention, policy preference, or extrapolation from a limited set of case studies. GRNR was presented as a synthesis of experience from 25 years of agri-environment agreements in the Lake District high fells. However, the Lake District National Park Partnership's Concerns and Actions in the State of Conservation Report noted that there is no comprehensive long-term dataset for sheep stocking rates or hefting numbers[25], and stressed that nature recovery, deer management, hefting viability, and farm viability should be considered *together* rather than in isolation. This does not imply that NE lacks agreement-level stocking calendar data for specific sites.

This section is therefore structured to consider the observed stocking rate from several lenses. The literature cited within GRNR itself was examined on its own terms, to establish that evidence cited in the report genuinely supports the conclusions drawn from it, and to clarify that sources are being used within their proper geographic and ecological scope. Evidence from comparable upland scientific studies provides the closest ecological and managerial context; UK uplands more broadly are a distinctive livestock-grazed system and consideration of how grazing intensity affects habitat condition and recovery has been studied in several comparable habitats, though sites with similar habitats are more often found in Scotland and Wales. Several experimental studies are also summarised, as they offer the strongest basis for causal inference, by

more systematically allowing grazing effects to be separated from confounding influences such as weather, soil, historic management, or stock composition.

Evidence from comparable habitats across Europe enables us to establish whether similar grazing responses occur in other mountain, heath, and semi-natural grassland systems, or whether the Lake District case is unusually site-specific. Finally, stocking rate changes are considered in relation to farm-business realities: upland grazing decisions are not simply ecological choices, they are embedded in farm economics, support payments, and the practical viability of hill farming, all of which shape whether a proposed regime could be adopted and sustained.

For clarity, this review will distinguish between an agreement's maximum annual average stocking level, seasonal or daily stocking pressure when sheep are actually present, and actual grazing levels observed on the ground. GRNR does not present 0.5 ewes/ha as a universal rate; rather, it reports that good recovery has sometimes been observed up to about 0.5 ewes/ha annual average, while no sites at or above 0.6 ewes/ha annual average were identified as achieving all objectives. In correspondence and rollover negotiations, this figure appears to have functioned for some stakeholders as a highly influential local reference point, but NE states that agreement advice is also based on site-specific survey data, condition assessments, national NE assessments of upland grazing evidence[26], professional judgement and peer review.

It is therefore important to note that claims about stocking levels are often confused by the measurement of stocking rates in terms of:

a) density, sheep per ha or ewes per ha[27]

   Natural England has emphasised that a 'ewes per ha' figure is the number of breeding ewes in a fell flock and this assumes that these ewes are accompanied by followers (lambs at foot and hoggs) at normal proportions (an average of one lamb per ewe and just over a third as many hoggs as ewes to provide a regular supply of replacements for ewes that become too old to remain on the fell).[28]

b) values, 'average' stocking rates versus 'maximum' and related, timeline, annual versus daily.

   An average stocking rate over a year may include periods when there are no stock on the fell – meaning that when stock is on the fell, the rate will be higher than the average.

One of the key conclusions of GRNR is that

> "Habitats on the fells have recovered best under low grazing pressure. Recovery of existing SSSI habitats has been universally good below a year-round average of 0.4 ewes/ha. Good recovery has sometimes been seen up to an annual average of about 0.5 ewes/ha. No sites stocked above an annual average of 0.6 ewes/ha are achieving all of their objectives for existing habitats."[29]

This conclusion is derived from the GRNR authors' observations regarding the impact of grazing levels they have seen specifically within the Lake District's High Fells SAC, rather than from scientific literature. Highly variable stocking levels are evident in academic literature on vulnerable habitats in Northern England, specifically relating to peatland bog. Research from as early as the 1980s[30] includes stocking rate recommendations as low as 0.1-0.37 sheep/ha on blanket bog and 0.5-2.0 sheep/ha on heather moor. In the 2010s, 0.5 ewes/ha was recorded as a low stocking density in studies on blanket bog sites (though grazing impact was not the focus of the study)[31].

Box A: understanding stocking-rate terms

In this review, **ewes/ha** refers to breeding ewes per hectare, including their normal followers, unless otherwise stated. An annual average stocking rate expresses grazing pressure across the whole year. This can obscure higher seasonal grazing levels during the months when sheep are actually present on the fell. For example, a relatively low annual average may still involve higher summer or autumn grazing densities.

Where agreement calendars specify a **maximum annual average**, this should not be read as a fixed year-round stocking rate or as a direct measure of grazing actually delivered on the ground. Actual grazing pressure will vary according to seasonal turnout, gathering dates, weather, shepherding, stock behaviour, vegetation type, terrain, and compliance with the agreed calendar.

It can be useful to distinguish between 'stocking rates', 'grazing regimes', and 'grazing patterns', emphasising that multiple dimensions of grazing management are vital to consider the many ways in which mammals,

including domestic livestock, can impact habitat restoration:

> "Management decisions determine the *grazing regime*, which consists of stock type [and breed], *stocking rate* and grazing pattern. Variation in the timing, intensity, frequency and duration of grazing [regime] in each management unit results in distinct grazing patterns, which determine key aspects of ecosystem functionality." [32]

Utilising a single factor within the grazing regime, such as stocking rate, therefore, prescribes a limited mechanism through which land managers can impact the quality of a habitat.

Case Study: application of evidence in GRNR

One of the suggestions made by Natural England was to consider the extent to which conclusions of the GRNR report 'appear to be reasonable given the evidence quoted'. As previously stated, much of the report is based on local NE knowledge and observations over a sustained period, rather than from experiments, scientific literature and other forms of evidence. However, there are instances where some of the references used in the *GRNR* report do not sufficiently qualify the breadth of the claims being made. For instance, the report states that "*Soil permeability is also important; if water can soak in to the ground then the rate at which it contributes to flooding will be reduced. Work by Nick Chappell of Lancaster University shows that soil permeability is greater closer to the trunks of broadleaved trees.*"[33],[34]

While this statement is not incorrect, the citation somewhat obscures the details of the evidence referenced. The source presents three case studies and explicitly notes that the impact of trees on soil permeability is mediated by multiple positive and negative factors associated with tree growth and management, and that the relative importance of these factors depends on tree species, soil type, local climate, and land management.[35]

Moreover, the GRNR report also appears to generalise from a specific example within the paper without adequately reflecting the original context. The broadleaved-tree example in the Chappell paper concerns oak trees in a parkland setting in Lancaster[36], whereas the other two case studies (upland Wales and Tebay) are more directly relevant to the Lakeland High Fells context. In those cases, the Welsh study found statistically significant differences in soil permeability at locations further *away* from Sitka spruce, while the Tebay example showed no statistically significant differences in permeability around saplings on Tebay Fells. The source material suggests a much more contingent and context-dependent relationship than the report's wording implies. GRNR thus makes a statement here that is broader and more definitive than the cited evidence justifies.

In another example, the report states that "Ecologists generally consider that moderate grazing pressure can increase plant diversity in productive environments by reducing competition between plants and increasing establishment opportunities. However, this is not the case in low productivity environments, such as mountains, where competition is limited by stress (such as cold, drought, poor soils."[37] The report cites a seminal 1977 paper from Grime to evidence this statement. This paper can certainly be used to support a broad theoretical point that disturbance does not operate independently of productivity. Grime argues that in potentially productive environments, low-intensity disturbance can alter the balance among competitive species, whereas in strongly stressed, low-productivity habitats, stress itself becomes the dominant constraint[38]. Read this way, the paper supports the report's general contrast between fertile and infertile settings, but it does so at the level of a conceptual framework rather than as a direct analysis of grazing and diversity.

Additionally, Grime describes unproductive habitats as systems where biomass remains low and vegetation is filtered toward stress-tolerant forms, with the ruderal phase (post-disturbance colonisation) sometimes disappearing altogether. That is consistent with the idea that grazing will not have the same diversity-enhancing effect there as in more fertile systems, but Grime does not state that moderate grazing fails to increase diversity in all low-productivity environments. So, the report's statement is best treated as an interpretation built from Grime's theory, not as a precise claim established by the paper itself, and so, as the sole reference provided, the evidence is weak, and this claim could have been made clearer or more robustly evidenced in GRNR with more recent and relevant empirical examples.

These examples indicate that the report often uses scientific sources illustratively rather than with full methodological caution. Its use of that evidence is sometimes broader and less qualified than the original

sources would warrant. However, this should not be read as a fundamental weakness in the report as a whole, since it was not intended to be an academic publication and is grounded primarily in long-term, on-the-ground observation of the landscape in real time. Nonetheless, where the report makes wider claims about ecological processes, these require careful scrutiny, and in the sections that follow we therefore summarise some of the broader scientific evidence that is directly pertinent to the report's main arguments.

Scientific evidence from relevant UK habitats

In order to examine relevant scientific literature from the UK context specific to the habitats referred to in the High Fells' SAC Citation, multiple literature searches were conducted on Web of Science. None of the searches conducted yielded a high number of papers, highlighting the limited scientific evidence that exists in relation to the impact of grazing on specific species or habitats existing in the Lake District, including alpine and boreal heaths. Even broader terms often yielded limited results, for instance 'grazing pressure', 'vegetation dynamics' & 'upland' yielded only two results, and 'boreal heath' & 'grazing' returned a single paper.[39]

A particularly relevant source in this context is Natural England's own evidence review, *Impact of moorland grazing and stocking rates* (NEER006), which formed part of the Natural England Review of Upland Evidence. One of the authors of the present review was also an author of NEER006. That review was systematic in approach and provides an important national synthesis of evidence on grazing regimes, stocking rates, moorland biodiversity and ecosystem-service delivery. It should therefore be recognised as a central source in understanding Natural England's national evidence base.

NEER006 does not remove the need for caution in translating national evidence into specific local stocking prescriptions. Indeed, one of its most important conclusions is that upland grazing management is inherently complex. The review states that "management of the English uplands is complex and achieving good environmental outcomes, while taking into account the needs of owners, stakeholders and other interests is a balancing act." It also found that the quality of evidence was variable, with only 21% of the individual conclusions underpinning its key points based on evidence judged to be strong, and concluded that there is a relative lack of good-quality studies on which to base management decisions.

NEER006 should therefore not be read as providing a simple evidential mandate for fixed or standardised stocking threshold, rather it supports the need for pragmatic, site-specific and adaptive decision-making. This review found that stocking-rate effects vary between sites and years, that vegetation productivity differs according to habitat type, soil, climate and topography, and that the effective stocking pressure experienced by particular habitats within a mixed grazing unit may be higher or lower than the average rate for the whole unit. It also emphasised the importance of monitoring the utilisation of key vegetation components and the spatial distribution of grazing impacts, so that grazing regimes can be reviewed and adjusted in relation to clear site objectives.

Where evidence is incomplete or variable, management decisions should be transparent about uncertainty, proportionate to the evidence available, and designed to learn over time. NEER006 supports action to address damaging grazing where it is observed, but it also supports the need for adaptive management, clear site-specific objectives, monitoring, and careful attention to spatial grazing patterns, livestock behaviour, vegetation mosaics and the wider farming system. NEER006's findings are therefore consistent with the approach taken in this review: the issue is not whether recovery should proceed, but whether the evidence base, monitoring process and agreement design are sufficiently transparent and locally grounded to command confidence among those expected to deliver the management change.

Alpine and boreal heaths, in particular, are unique habitats for their biodiversity and ecological functions, and are vulnerable to a wide range of human-led activities. Anthropogenic impacts occur both above and below ground: a multi-year study from 2009 on Scottish Alpine Heath showed that there was a significant effect on soil solution in the ecosystem from nitrogen deposition and burning, but a simulated grazing treatment had no effect on the solute chemistry and no interactive treatment effects were observed [40]. Other research in Alpine habitats at an altitude of 750 m above sea level has shown some evidence of a decrease in soil solution dissolved organic carbon when sheep are present, but only when plots were also burned[41]. Nitrogen deposition has been shown to pose

a threat in alpine habitats where nutrient inputs are otherwise very low[42]. Where Heather is dominant on heathlands, experiments have shown that increased nitrogen input has capacity to exacerbate dominance through increased shoot growth, resulting in changes to vegetation community composition[43] and declines in species diversity[44]. Increased grazing can therefore in some circumstances be a mitigation measure to counteract the effects of nitrogen deposition.

Studies on alpine heath in Wales examined whether grazing pressure is harming key alpine species, such as Woolly Fringe Moss, beyond the effects of nitrogen deposition. The aim was to see whether reducing grazing could improve heath condition. The findings were mixed. Some results suggested that higher tissue nitrogen levels were linked to greater membrane potassium leakage, and that this was associated with dung deposition. However, other results found no consistent difference in growth between habitats with low and high grazing pressure. The studies therefore suggested that poor heath condition may be the result of "the cumulative effects of the past heavy grazing regimes including additional nitrogen input (from sheep dung) and physical damage from trampling"[45] rather than a detrimental impact of current grazing alone.

Another study, which examined factors affecting the biotic homogenisation of upland vegetation types in Scotland, found that composition change across vegetation was most significant in grassland and alpine heaths, noting that species richness is significantly reduced by nitrogen deposition, and where *Molinia* becomes dominant in grasslands, shorter species such as the common bent undergo significant decline where sheep grazing is removed.[46] They highlighted too that the "sensitivity of alpine heaths to environmental change that we have demonstrated in this study is widely recognised as being due to the short growing season and low temperatures conferring low resistance and resilience", and that regarding the increasingly oceanic climate of the UK, the "loss of plots classified as boreal heath communities also fits with this pattern of climate change"[47].

These findings are consistent with recent research which suggests that *Molinia* dominance should not be attributed to stocking rate alone, but to interacting pressures that alter competitive relationships within upland plant communities. *Molinia* is a native component of several mire, heath and grassland communities, but can become dominant where hydrological change, reduced waterlogging, drainage, atmospheric nutrient deposition, repeated burning, grazing history and disturbance favour its rapid spring growth, dense tussock formation, extensive rooting and accumulation of coarse litter.[48] The removal or reduction of sheep grazing may not simply allow more desirable species to recover, in *Molinia*-dominated swards, reduced grazing can also allow coarse biomass and litter to accumulate, suppressing shorter species and limiting opportunities for heather, *Sphagnum* or other indicator species to establish. *Molinia* dominance should therefore be understood as an outcome of site condition, nutrient status, hydrology, climate, fire history, grazing regime and subsequent management, rather than as a simple indicator of either overgrazing or undergrazing.

Molinia management literature also suggests that there is no single solution to *Molinia* dominance. For instance, one study found that glyphosate had the most consistent direct effect on reducing *Molinia*, but that heather recovery required disturbance, litter removal, seed addition and follow-up management, with responses varying by site, region and starting vegetation type[49]. Another that *Sphagnum* propagules could establish within *Molinia*-dominated blanket bog and increase indicator species cover, but establishment was slower in dense *Molinia*, while flailing gave no clear benefit and reduced naturally occurring indicator species[50]. Other work indicates that targeted conservation grazing may help in some contexts: Dartmoor ponies attracted by salt blocks reduced *Molinia* occurrence, lowered sward height, increased bare ground and encouraged heather germination,[51] while harvested *Molinia* may have potential as a low-sugar equine forage if further research supports its use[52]. Recent evidence thus supports active, site-specific management where hydrology, nutrient status, fire history, grazing species, timing, restoration objectives and follow-up intervention all need to be considered together.

The Macaulay Lane Use Research Institute (MLURI) Hill Grazing Model[53] was a conceptual and practical framework developed for use in upland land management to balance livestock grazing with ecological sustainability. It emerged from UK hill farming research conducted in Scotland and Northern England[54] including the Lake District and was designed to be applied to semi-natural habitats such as heather

moorland, rough grassland, and blanket bog. At its core, the model links stocking density (number of animals per unit area) with:

- Vegetation type and productivity
- Seasonal forage availability
- Animal nutritional requirements
- Long-term habitat condition

It recognised that upland systems are highly variable and are of low productivity, so grazing must be carefully matched to what the land can sustainably support. The key principles built into the MLURI model were:

- Carrying capacity is not fixed, rather it changes with weather, soil fertility, vegetation composition and management history
- Different vegetation types support different grazing levels, for example improved grassland has high stocking potential, heather moorland has low stocking potential and blanket bog has very low or negligible grazing (stocking) capacity
- Seasonality is critical, hence although there is higher forage availability in summer, this is much more limited in winter. Hence if winter stocking is at summer levels, there is a risk of overgrazing
- Selective grazing matters given that sheep preferentially graze grasses over heather.[1] This can gradually shift vegetation composition if unmanaged[55]

The core challenge was setting appropriate stocking densities, and this was/is the most difficult part of applying the model, especially in upland landscapes with a mix of different habitats. In particular, upland areas contain mosaics of habitats (such as acid grassland, heather moorland, wet heath and peat bog) and each habitat differs in terms of productivity and resilience. Hence, applying a single stocking rate across a whole hill/fell rarely works – if it is set too high for sensitive habitats these will be degraded, if it set too low for productive habitats these will be underutilised – as it leads to uneven grazing pressure and habitat imbalance.

This challenge is compounded by the fact that assessing carrying capacity is imprecise. Unlike lowland pasture, habitats in the uplands generally have poorly quantified forage production, show large year-to-year variation and are affected by altitude, slope, and exposure. Managers therefore often rely upon experience, visual assessment and historic stocking levels. This introduces uncertainty and the risk of miscalculation.

If stocking density is too high, heather and dwarf shrubs decline, grass dominance increases, soil can become exposed (leading to erosion) and peatlands can degrade (leading to carbon loss). If stocking density is too low, heather can become rank and woody, scrub and tree encroachment may occur, and biodiversity linked to open habitats may decline. The model highlighted that both extremes are problematic.

Animal behaviour further complicates attempts at stocking rate calculations. Livestock do not graze evenly, but rather prefer lower slopes, sheltered areas and better-quality forage. This can lead to overgrazing in preferred areas and undergrazing in remote or rougher areas. Hence even with the "correct" overall stocking density, such spatial imbalances will persist.

Stocking rates are often set annually, but winter forage is the limiting factor and summer grazing can mask unsustainable winter pressure. Hence a density that seems appropriate in summer may cause habitat damage in winter and/or require the use of supplementary feeding (which further alters grazing patterns).

Finally, stocking rate decisions are not based purely on ecological considerations. Historically, agricultural subsidies encouraged higher stocking. Farm income depends on livestock numbers and conservation schemes may push for reductions, creating tension between economic viability and ecological sustainability.

Additionally, current agricultural and environmental policy explicitly requires land management to deliver multiple outcomes. The Agriculture Act 2020 enables financial assistance for environmental improvement, climate mitigation and adaptation, soil quality, livestock health and welfare, public access, cultural and natural heritage, and productivity, while also requiring the Secretary of State to have regard to the need to encourage food production in an environmentally sustainable way.[56] The recently published Farming

[1] Although sheep may browse heather in some seasonal or spatial contexts, their grazing is strongly shaped by the availability and pattern of preferred grass patches, and heather utilisation can increase around grass/heather boundaries or where wild herbivore pressure rises. DeGabriel et al. (2011) found that sheep removal was associated with higher deer use, shorter heather, and reduced plant diversity, indicating that mixed grazing can sometimes reduce heather damage and maintain diversity more effectively than sheep removal.

Roadmap similarly frames the future of farming around four linked objectives: profitability, productivity, sustainability and resilience, and states that food production, environmental delivery and economic viability must be delivered together rather than treated as separate aims[57]. At the scale of land-use decision-making, the Land Use Framework similarly emphasises multifunctional land use, domestic food production, nature recovery, climate mitigation and thriving farm businesses as connected rather than competing objectives.[58]

In this context, stocking-rate decisions on Lake District commons need to consider ecological condition alongside the social, economic and practical systems through which grazing management is delivered. This does not mean that ecological recovery should be subordinated to farm-business preference, but that recommendations for grazing reduction need to be designed in ways that are ecologically justified, economically viable, practically deliverable and socially durable. Historic subsidy regimes are relevant because they have shaped existing stocking patterns, flock structures and land-management expectations. However, the central issue now is forward-looking: if agri-environment agreements are expected to deliver habitat recovery, carbon, water, soil, cultural landscape and food-system outcomes over the long term, they must be designed around the whole upland system, including payment levels, business resilience, common-land governance, hefted flock viability, labour, tenancy arrangements and the ability of farmers and commoners to sustain the agreed management beyond the life of a single agreement.

To address these challenges, the MLURI hill grazing model supports:

- Variable stocking strategies, where different densities can be set for different habitat zones and the use of fencing or shepherding can be taken into account.
- Adaptive management, in that stocking can be adjusted annually based on weather and vegetation condition
- The use of mixed grazing, where sheep, cattle or ponies can be combined to improve vegetation balance and reduce selective grazing effects
- The use of indicators to monitor the grazing impacts on heather condition, grass/shrub ratios, the amount of bare ground and erosion and animal condition.

A key outcome is that application of the model shows that there is no single "correct" stocking density for uplands. Instead, the challenge is managing a dynamic balance between animal needs, vegetation responses, spatial variability and seasonal constraints. The central difficulty is translating a theoretical "carrying capacity" into practical, site-specific stocking decisions in landscapes that are inherently complex and variable.

The value of considering the MLURI model in this context is that it approaches the question from a different but complementary starting point regarding the physiological requirements of grazing animals, the seasonal productivity of upland vegetation, and the carrying capacity of different habitat mosaics. This is particularly useful where previous national evidence reviews of upland grazing and stocking rates published by Natural England have identified limits in the direct empirical evidence available for specifying precise stocking thresholds across complex upland systems.[59] Instead, the challenge is managing a dynamic balance between animal needs, vegetation responses, spatial variability and seasonal constraints. The central difficulty is translating a theoretical "carrying capacity" into practical, site-specific stocking decisions in landscapes that are inherently complex and variable. Effective management therefore requires habitat-specific decisions, flexible stocking and continuous ecological monitoring.

These previous studies in comparable UK habitats demonstrate the importance of nitrogen deposition, burning, climate change, past management, trampling, dung input, and the timing, intensity and pattern of grazing, indicating that stocking rate is only one part of a wider grazing regime, and changing stocking rates by itself is unlikely to deliver habitat restoration unless it is considered alongside other drivers of habitat condition.

Ten heathland grazing experiments were run by the Hill Farming Research Organisation and the Macaulay Land Use Research Institute[60]. A number of key results are worth noting in this context.

For the dry heath site near Dufftown (Moray) at 300 m[61], the low stocking rates were 0.82/0.93 sheep/ha/yr (no lambs or followers) and showed good heather recovery and heather utilisation rates below 20 % (proportion of current year's biomass consumed, not proportion of shoots grazed). The stock were Scottish Blackface ewes, a bit bigger than Herdwicks. This equates to

0.066/0.074 LU if you use 1 ewe/ha/yr = 0.08 LU. There was improvement in heather condition and cover at 1.64/1.86 sheep/ha/yr, but it was much slower. This equates to 0.13/0.15 LU.

For the wet heath site at Redesdale in Northumberland (300 m)[62] the low stocking rates were 0.7 sheep/ha/yr and showed good heather recovery and utilisation rates below 20%. Grazing was by Swaledale ewes. This equates to 0.056 LU. Improvement was slower at 1.4 sheep/ha/yr, utilisation was still below 30 % (equates to 0.11LU).[63]

Across the ten experiments (Pakeman & Nolan 2009) where stocking rates were in the order of 0.7 sheep/ha/yr (0.056 LU), heather utilisation rates ranged from c. 5 % to 30 %. This clearly shows that the other vegetation present is important in setting stocking levels. More productive areas with dominant species much more preferred than heather can be set higher stocking rates than areas with less productive vegetation and where the dominant species are similar in preference to heather. These studies provide valuable controlled evidence and contextual evidence which, though it is not directly transferable given variations in altitude, exposure, productivity and growing-season length, (however, though the Dufftown site is lower in elevation than many areas of the Lake District, it is considerably further north. Looking at the 1990-2020 climate averages, the 10 km square containing the Dufftown site is about 0.8°C warmer in July than the 10 km square containing Helvellyn. However, it is 0.5°C colder in the winter, suggesting that productivity will be similar) nonetheless highlights that existing vegetation composition plays a vital consideration alongside stocking rates in habitat recovery.

Scientific evidence from habitats across Europe

This wider picture is also reflected in the European literature, which offers further examples of how habitats respond to interacting pressures rather than to grazing pressure in isolation. The European Environment Agency (EEA)[64], with support from European Forum on Nature Conservation & Pastoralism (EFNCP), Wageningen Environmental Research (WENR) and others, has recently carried out a multiyear study (2021–2024) examining the role of extensive livestock grazing in maintaining Europe's seminatural habitats, those habitats that depend on low intensity agricultural practices to remain in favourable ecological condition.

The study focused on two key questions:

- What proportion of Europe's remaining livestock systems are extensive, as estimated by the area of land under extensive grazing?
- Which habitat types benefit from grazing and at what stocking densities?

These questions are distinctly relevant given that many Annex I habitats of the Habitats Directive depend on grazing to prevent scrub encroachment, maintain species richness, and preserve open or mosaic vegetation structures. There is concern across Europe that over- and especially under-grazing is leading to a decline in the condition of many of those habitats.

Only the second question is of direct relevance to the ongoing work in the Lake District. Experts across Europe were asked what density of livestock do the various habitats 'need' in order to be brought to and maintained at favourable status? The responses were expressed as averages over the grazing season and in many cases the estimates were given in the form of a range, reflecting not only possible uncertainty on the part of the experts, but also a real variation between the grazing needs of different sub-communities within the overall habitat.

It should be noted that, within the EFNCP and EEA study, blanket bog was *not* considered a habitat dependent on grazing within the multiyear study (meaning that the project determined this habitat does not need grazing, not that the habitat should have no grazing at all) and hence it was not included in the review. However, for upland habitats occurring in north-west England that are regarded as needing grazing in order to be brought to and maintained at favourable status, stocking density ranges were from 0.1 – 0.6 LU/ha, for example:

- Northern Atlantic wet heaths with *Erica tetralix* (cross-leaved heath): 0.1-0.2 LU/ha
- Alpine and Boreal heaths (found on the high tops in the Lake District): 0.2-0.3 LU/ha
- Dry heaths: 0.3-0.6 LU/ha

However, the report also highlighted that there was considerable uncertainty around the stocking data ranges for Dry heaths in particular, because these vary in their flora and fauna according to climate, altitude, aspect, soil conditions and grazing intensity, creating wide variation in habitat condition, making a single

representative stocking density difficult to define. These European figures should not be compared directly with annual-average stocking calendars in Lake District agreements, because they are expressed as stocking densities for habitat maintenance rather than as annual-average rates across a whole year. However, when approximate conversions are made, they do raise an important point. If 0.5 ewes/ha is converted using an indicative value of 0.08 LU per ewe, this equates to approximately 0.04 LU/ha as an annual average. If that same annual average is delivered over an eight-month grazing period, assuming a four-month livestock exclusion, the effective grazing-season density would be approximately 0.06 LU/ha.

Therefore, the commonly referenced annual average of around 0.5 ewes/ha may, when expressed in livestock-unit terms and adjusted for seasonal exclusion, fall close to the lower end of the indicative ranges identified in the European evidence. For example, the Chapman technical note[65] cited by the European research gives 0.04–0.10 LU/ha as an indicative annual stocking-rate range for wet heath. On this basis, the local maximum used in some Lake District agreement contexts may be equivalent to, or only marginally above, the European minimum suggested for maintaining some grazing-dependent heathland habitats.

This does not mean that the European figures provide direct evidence for or against any specific Lake District stocking calendar. Nonetheless, it reinforces the need for caution when interpreting stocking figures across different evidence sources. It also suggests that where maximum annual-average rates are set at around 0.5 ewes/ha, those rates should not automatically be understood as moderate or high in relation to wider habitat-maintenance guidance. In some cases, they may sit at the lower boundary of grazing levels considered necessary to maintain particular heathland features, especially where grazing is further constrained by seasonal exclusions, sheep behaviour, altitude, vegetation type and uneven grazing distribution.

How do proposed stocking rates consider or relate to farm businesses?

Defra's preferred measure of farm income is Farm Business Income (FBI), which is the total output generated by the business (including diversification and agri-environment payments) minus total costs. Farm income data is derived from the annual Farm Business Survey (FBS), based on a sample of 1,426 farms in England. This sample size produces statistically robust data at national and farm type levels. It should be noted, however, that these data are averages and that there will be a wide variation in incomes around this average. The figures for 2025/26 are forecast and therefore subject to change at a later date. When considering changes to stocking rates, the ability of a hill farm to reduce grazing pressure depends not only on ecological requirements, but also on whether the business can remain financially viable under a different management regime.

Farm Type	2022/23	2023/24	2024/25	2025/26 forecast	% Change from 2024/25 to 2025/26
Cereals	143,300	41,500	49,700	17,000	-66%
General cropping	116,400	104,400	107,700	54,000	-50%
Dairy	228,600	73,000	153,800	224,000	45%
Grazing livestock (Lowland)	24,100	18,500	41,300	45,000	9%
Grazing livestock (LFA)	25,100	25,100	40,300	37,000	-8%
Specialist pigs	72,500	134,600	126,700	75,000	-41%
Mixed	67,200	22,700	58,000	40,000	-32%

Table 1: Average Farm Business Income per farm at current prices (£/farm). Source: Defra Farm Business Survey

As can be seen in Table 1, FBI can vary considerably year on year. The forecast figure for upland (LFA) grazing livestock farms represents an 8% reduction on 2024/25, as a result of reduced delinked Basic Payment, lower income from AES, and increased input costs.[66] For farms in marginal upland areas, even relatively small changes in support payments or output can therefore have a significant effect on management choices, including decisions about grazing levels.

Defra presents FBS data by four 'cost centres' (agriculture; agri-environment and other payments, such as FIPL; diversification; and Basic Payment Scheme). As can be seen in Table 2 below, in 2024/25 upland livestock farms made a small loss on their agriculture account. This was more than offset by income from the other three cost centres, including a notable average £23,600 from agri-environment and

other schemes. In other words, agri-environment schemes accounted for just under 59% of farm business income on upland livestock farms in 2024/25. As delinked payments continue to decline, income from AES will become relatively more important, and any significant threat to such income could ultimately jeopardise the viability of farming businesses.

Farm type	Agriculture	Agri-environment and other Payments	Diversification out of Agriculture	Basic Payment Scheme	Farm Business Incomed
Cereals	-27,400	25,900	32,600	18,600	49,700
General cropping	23,800	25,200	40,500	18,100	107,700
Dairy	111,600	21,900	7,300	13,100	153,800
Lowland grazing livestock	900	17,000	14,300	9,100	41,300
LFA grazing livestock	-2,700	23,600	7,500	11,900	40,300
Specialist pigs	85,700	9,100	21,900	10,000	126,700
Specialist poultry	160,700	11,800	54,900	8,500	235,900
Mixed	-4,700	22,800	24,300	15,600	58,000
Horticulture	28,100	7,000	15,900	1,800	52,700
All Farms	14,200	21,100	22,400	13,500	71,200

Table 2: Average Farm Business Income by farm type and cost centre (2024/25). Source: Defra Farm Business Survey

This shows that stocking rate changes cannot be considered in isolation from the income streams that help sustain hill farms, especially where support payments are central to business viability. The recent announcement regarding the delay/non-availability for relaunched 2026 applications of common land from Countryside Stewardship Higher Tier (in relaunched scheme applications) may have significant socio-economic impacts on the viability of farms with common grazing rights and therefore on the environmental management and outcomes of some of our most important (and protected) areas for biodiversity and nature recovery, including major areas of uplands and SSSIs. In this very uncertain context, proposals to alter stocking rates need to be assessed against their likely effects on farm income, payment eligibility, and the long-term practicality of adoption. Recent research has also shown that upland farmers' willingness to engage with future agri-environment schemes is shaped by past scheme experiences, place identity, opportunity costs, trust, and the need for evidence and tailoring to farm circumstances[67].

Some farm consultants argue that hill farms may improve profitability by reducing output to the level that can be supported by the farm's naturally available resources, thereby removing or reducing the 'corrective variable costs' associated with producing beyond natural carrying capacity[68]. The central economic rationale is that variable costs are not always linear, and beyond a particular point, additional output may require additional inputs whose costs rise faster than the value of the extra production generated. The 'Maximum Sustainable Output' (MSO) is level of output at which the farm's agricultural activity is most economically sustainable before support payments and other non-agricultural income streams are considered[69]. This approach challenges the assumption that increasing livestock numbers or production volume will necessarily improve profitability, encouraging farmers to examine the agricultural cost centre separately from agri-environment payments, diversification income and other business activity, consistent with wider evidence that LFA farms are economically fragile and that profitability cannot be explained by size alone[70].

To strengthen the claim sometimes derived from 'Less is More', that farming at MSO is reliably more profitable than more conventional or higher-output upland farming systems, these approaches would benefit from publication of a peer-reviewed econometric model or a transparent, independently testable dataset. The method is a practical farm-business diagnostic framework rather than scientific proof that reduced-output systems are universally or predictably more profitable. MSO is a modelled estimate[71], not a static figure, and it depends on a range of physical factors. If the MSO point is dynamic, then it will shift with lamb and cattle prices, input prices, labour availability, tenancy costs, soil fertility, grass growth, weather, breed choice, marketing route, and access to agri-environment or other public payments. Care should therefore be taken to ensure that as a fixed biophysical or economic optimum, particularly in consideration of the current lamb prices which highlight that calculations based on earlier farm accounts or average assumptions may not reflect the current profitability of higher-output sheep systems. Economic and environmental viability

require farm-specific and time-specific sensitivity analysis.

Other economic research reviews of conventional, organic and alternative agricultural systems has found that lower-input or organic systems can outperform conventional systems economically, largely through lower costs and higher market prices, but also noted lower yields, price-premium dependence, subsidy effects, labour implications and market risks, supporting a tailored 'a la carte' approach to enterprise optimisation, rather than wholesale adoption of one model across all farms. This nuance highlights that the economic advantage of low-input production is plausible, but as above it depends on prices, costs, market access, labour, support payments and the farm's production system.[72], as well as on size, location and environmental aspects of the farm.

Similarly, findings of a peer-reviewed linear programming model, based on Farm Business Survey data from 139 English hill farm businesses, suggested potential to improve profitability through better input-use efficiency and spatial allocation of resources, but the transition pathways depended strongly on available arable land, livestock type, feed requirements, housing capacity, labour and land-use constraints.[73] In some scenarios livestock units remained the same; in others they decreased. Sheep enterprises were preferred over beef cattle from a profitability perspective within the optimisation model. This complicates a 'less is [*always*] more' narrative, as profitability may improve through better spatial and enterprise optimisation, but not necessarily through uniform destocking or reduced input/output alone.

Ecological reductions in stocking rates may improve farm profitability in some cases, even many cases, particularly where current production depends heavily on purchased feed, fertiliser or other corrective costs, or where a farm can add value through direct marketing, premium products, diversification, cattle integration or agri-environment income. However, it may not do so where the farm already operates with relatively low inputs, where output prices are unusually strong, where fixed costs remain high regardless of stocking level, where labour and machinery cannot easily be reduced, or for instance where a hefted sheep system would be damaged by destocking in ways that are not captured in annual accounts.

Agri-environment payments are central to this discussion, but their importance does not remove the tension between ecological sustainability and economic viability. The above data on LFA grazing livestock farm accounts demonstrates that public payments are already essential to many upland farm businesses. However, it does not follow that any stocking reduction attached to an agri-environment agreement is economically viable for every farm. Payments may be designed to compensate for specified actions or income foregone, but they cannot automatically account for all indirect, long-term or system-level effects, including loss of flock structure, restocking costs, reduced breeding replacements, changes to labour use, cash-flow problems, tenant obligations, or damage to hefted systems.

Additionally, research in Northern Ireland on agri-environment participation found that upland farmers' willingness to engage with future agri-environment schemes is shaped by past scheme experiences, place identity, opportunity costs, trust, and the need for evidence and tailoring to farm circumstances[74]. The Northern Irish team's stakeholder workshop summary emphasised that financial incentives should be timely, stable, sufficiently large and long-term, and that scheme design should avoid conflicts with other support or rural development payments[75]. Policy uncertainty, bureaucracy, market forces, tenancy restrictions, labour costs and limited income are also identified as barriers that frustrate farmers' capacity to engage with climate and environmental transition[76].

Practical tools like MSO can be a useful challenge to output-maximising assumptions and as evidence that some farms may improve margins by reducing unnecessary inputs. Nonetheless, such approaches do not constitute scientifically evidenced, universal economic proof that low-input, lower-output systems are *always* more profitable. Hill farm profitability depends on the *interaction between* output prices, input costs, agri-environmental payments, fixed costs, farm structure, enterprise mix, land capability, stocking system, market route and long-term resilience. Economic models applied to Lake District commoning and hefted flock systems would require transparent, farm-level economic modelling, sensitivity testing under current sheep prices, and explicit assessment of the long-term costs of destocking and possible restocking. Additionally, fell stocking decisions cannot be fully understood in isolation from the wider hill-farm system, including in-bye land, winter forage, input use, hay meadow management, labour, tenancies, over-

wintering land and public payments. Future assessment of stocking-rate change should therefore consider whole-farm viability, not only the fell-grazing calendar.

In the Lake District fell commons, the hefting system presents particular business sustainability challenges. Hefted sheep, which graze specific areas of the commons according to historic shepherding patterns are key to the efficient use of common grazing land. Stocking rates therefore need to be considered not only in relation to habitat condition, but also in relation to the minimum flock size, breeding structure, labour, tenancy obligations and common-land relationships required to maintain a viable hefted farming enterprise capable of delivering management over time. Many Lake District tenancies on farms with a commitment to maintain their flocks, also require that a 'Landlords' flock' of hefted sheep remains on farm, and is passed on to any new tenant/land manager as a part of the farm. This can affect farming viability for farmers grazing different land across the Lake District, particularly where restrictions on stocking rates on fells can sometimes require flock sizes which fall close to, or even below, the number of sheep in the Landlord's flock, leaving limited scope for the tenant to maintain an independently viable livestock enterprise. While tenants may receive income from the sale of surplus lambs and draft ewes, maintaining a Landlord's flock is not simply a matter of retaining a numerical headcount: sufficient quality replacements must be kept back to preserve the flock's breeding value, hefting behaviour and long-term viability, meaning that the saleable element may be limited and may not provide a viable livestock income in its own right. Where landlords agree to reduce Landlord's flock numbers this may help accommodate agreement-level stocking reductions, but it can also weaken the very hefted system those flocks were established to protect, particularly if reductions affect the critical mass, inherited knowledge and spatial behaviour of the flock.

The hefting system also highlights that the impact of stocking-rate decisions are rarely confined to a single holding, agreement or management unit. On open fell commons, where there are often no physical boundaries between individual hefts, or between neighbouring commons, the stability of the system depends partly on the presence of adjacent hefted flocks, which maintain the mosaic system by occupying and reinforcing their own areas of the fell. Hefting (and herding) are therefore inherently relational[77], each flock's grazing pattern and homing instinct[78] is shaped not only by its own learned attachment to place, but also by the presence, density and behaviour of neighbouring flocks.

Where one farm enters an agri-environment agreement and significantly reduces its fell flock, or removes a hefted flock altogether, this can create a lower-stocked area into which sheep from neighbouring hefts may drift. This vacuum effect can displace grazing pressure rather than simply reduce it, potentially increasing trespass (from other sheep or deer), altering grazing patterns, weakening neighbouring heft boundaries, and creating new management problems for other commoners who were not party to the original decision. The impact may therefore be social and ecological as well as economic, as a change intended to reduce grazing pressure in one part of the fell can affect the distribution of grazing across a wider range of hills.

The viability of hefting therefore cannot be assessed only at the level of an individual agreement holder. Where stocking reductions affect open commons, the relevant unit of analysis may need to be the whole common, neighbouring commons, or the wider fell system within which multiple hefts and commons interact. Agreement design should therefore consider whether reductions are spatially uneven, whether they risk destabilising neighbouring hefts, and whether all commoners affective have been adequately and collectively involved in assessing the likely consequences. This is particularly important where the removal or substantial weakening of one heft could alter grazing behaviour across the wider landscape and make future management more difficult for both farmers and advisers.

For the purposes of this review, a "viable farming business" does not mean a business that maximises livestock output or resists ecological change, but refers to the minimum practical and economic conditions required for a farmer or commoner to continue managing the holding over time: maintaining a functioning flock, meeting tenancy and Landlord's flock obligations, covering labour and input costs, retaining sufficient breeding replacements, cash-flowing agreement requirements, and sustaining the skills and infrastructure needed to deliver environmental management. In hefted systems, viability also has a collective dimension, because the integrity of one flock can affect neighbouring flocks and the wider common.

A stocking regime may therefore appear ecologically plausible at the level of a habitat unit, while still being incompatible with the flock structure, tenancy conditions, labour requirements or common-land relationships needed to maintain an active farming system.

Habitat recovery and viable farming are not inherently incompatible. Rather, the evidence gathered through this review suggests that some current approaches to prescribing grazing reductions for nature recovery risk becoming incompatible with viable fell-farming systems where they are applied without sufficient attention to whole-farm viability, common-land interdependence and the minimum critical mass required to maintain hefted flocks. This is particularly acute where recommended stocking levels fall close to, or below, the number of sheep required to maintain a functioning breeding enterprise, Landlord's flock, or where reductions are spatially uneven across an open fell. In those circumstances, the agreement may, by reducing livestock numbers, weaken the very social, behavioural and practical system through which long-term grazing management is delivered.

This matters for nature recovery as well as for farm businesses. If a stocking regime undermines the economic resilience of agreement holders, weakens the heft, or displaces grazing pressure onto neighbouring areas, then the management may be difficult to sustain both within and beyond the agreement term and may create new ecological and social problems elsewhere on the common. The relevant question is therefore not simply whether a lower stocking rate would benefit a habitat feature in isolation, but whether the proposed grazing regime is ecologically justified, economically viable, practically deliverable and socially durable at the scale of the whole fell system.

Section Summary

The literature summarised in this section indicates that the empirical scientific basis for the 0.5 ewe/ha annual average figure is limited, and should therefore be understood as a pragmatic benchmark, drawn mainly from local observation in the Lake District High Fells SAC, rather than as a universal scientific threshold. GRNR states that habitats recovered best below about 0.4 ewes/ha and sometimes up to about 0.5 ewes/ha, but this conclusion comes from the report authors' experience of the site, not from a broad body of experimental evidence. The wider literature clearly demonstrates that stocking figures are difficult to interpret because they depend on how they are measured, whether they are annual averages or peak seasonal rates, and what other animals, habitats, and management practices are present.

The UK scientific evidence does not support a simple rule that 0.5 ewe/ha will reliably produce habitat recovery across alpine and boreal systems, nor has this review identified Lake District-specific scientific evidence of recovery on the discussed habitat types at or above 0.6 ewes/ha annual average. Studies from Scotland, Wales, and Northern England show that outcomes depend on interacting pressures such as nitrogen deposition, burning, climate change, trampling, vegetation type, and of course the timing and pattern of grazing. Experimental work on heaths shows that low stocking can sometimes support heather recovery, but the response varies widely between sites and habitat types, and the same nominal stocking rate can produce very different levels of utilisation. The Hill Grazing Model further reinforces that upland systems are heterogeneous and that there is no single correct stocking density for all habitats; management must be sensitively adapted to local carrying capacity, seasonality, and habitat mosaics.

The European literature points in the same direction, where habitat-specific estimates for grazing needs on upland semi-natural habitats commonly fall within ranges rather than fixed figures, and for alpine and boreal heaths in north-west England the reported range is broad enough to show uncertainty and local variation rather than precision around one number. Taken together, the evidence suggests that 0.5 ewe/ha is best treated as a cautious local management reference point, not as a strongly evidenced, generally transferable restoration target.

Judgements about whether stocking rate figures are appropriate also need to take account of farm-business viability, support payments, and the practical realities of maintaining hill farming. It is true that agri-environment income is central to many upland farm businesses, and the Farm Business Survey data presented above show that LFA grazing livestock farms, on average, made a small loss from the agricultural cost centre in 2024/25, with agri-environment and other payments forming a substantial proportion of overall Farm Business Income. However, this does not mean that the tension between ecological sustainability and economic viability is only perceived. Rather, it demonstrates that upland farm

viability is already dependent on a fragile combination of agricultural output, agri-environment income, diversification, remaining delinked payments, tenancy conditions, input costs, sheep prices, flock structure and available land type.

Additionally, the presence of agri-environment payments should not be taken as evidence that any proposed stocking reduction is automatically economically viable at farm level. Payment rates may be designed to compensate for income foregone, but they do not necessarily account for all indirect or long-term consequences of destocking, particularly in complex upland commons systems where reductions affect hefted systems, landlord's flocks, breeding replacements, future restocking costs, or the inherited behavioural and locally adapted characteristics of a flock, as was outlined by Defra in 2021[79]. Complete or substantial destocking can have effects that are not easily reversible if an agreement ends, because farmers may not be able to afford to rebuild a flock, and the hefting system, localised adaptation and associated knowledge may already have been weakened or lost.

The relationship between ecological recovery and economic viability is therefore a fundamental consideration and a crucial part of the delivery mechanism for environmental outcomes. Farmers are often required to demonstrate and maintain sufficient business resilience to enter agreements, undertake capital works, and carry costs before reimbursement. If the farming business is not economically secure, it may be unable to secure cash flow and deliver the restoration actions expected of it, even where the ecological objective is agreed. For this reason, a stocking rate that appears ecologically plausible in isolation still needs to be assessed in relation to whole-farm viability, agreement design, payment timing, the durability of hefted flock systems, and the practical capacity of farmers and commoners to sustain the management regime over time.

2. How has stocking rate evidence for agreements been generated, interpreted and applied on the ground in the Lake District during HLS rollovers?

Generation and interpretation of evidence

Indicators of Success: A Case Study

Within each agreement, a number of Indicators of Success are set for each option. Here, we closely examine a specific example from an existing HLS agreement for Option HL10, Restoration of Moorland. The Indicators of Success in this example agreement include:

- All SSSI land should be in favourable or recovering condition.
- On areas of blanket bog, including all areas of peat more than 0.5 m deep, between February and April no more than 33% of heather shoots should show evidence of grazing.
- By year 3, the majority of existing cotton grass should be in flower in spring and the majority of existing heather should be in flower between July and September.
- Less than 10% of bog-mosses (*Sphagnum*) should be damaged or dead.
- Disturbed bare ground should be less than 10% of the area.
- By year 7, the cover of bog-mosses (*Sphagnum*) should be at least 33%, and at least two dwarf shrub species should be frequent.

Similar requirements are set for dry heath and wet heath, although the specific indicators differ slightly to reflect habitat variation. More specific Indicators of Success are also set for particular areas of interest and for archaeological features.

It should be noted that this relationship between utilisation and the percentage of shoots grazed holds only for sheep and red deer. Where cattle are grazing heather, their larger mouths would mean a higher level of utilisation for a given percentage of shoots grazed.

Addressing the list of indicators within the overall blanket bog indicator of success is useful, as it highlights what is expected during the course of the agreement:

- "No more than 33% of heather shoots should show evidence of grazing" is a measure of how much grazing heather can sustain. If grazing remains below this threshold, the habitat is assumed to be in good condition; above it, the habitat is assumed to be under pressure and at risk of degradation. This figure is taken from Common Standards Monitoring (CSM) Guidance for Upland Habitats. The timing of measurement, at the end of winter, reflects the period when grazing pressure is likely to be highest, before spring growth begins.

Box B: Is 33% of heather shoots grazed a sensible threshold?

Ten experiments across Scotland and Northern England have been carried out monitoring the grazing of heather-dominated communities at different stocking levels. These were the subject of a meta-analysis[80] which showed that the balance between heather and grasses was positive for heather at levels below an estimated 31.6 % utilisation – the consumption of the current season's shoots. *Note this is a different but related measure than proportion of shoot grazed used in CSM and in the Indicators of Success*. A conservative estimate using the 95 % confidence intervals of the fitted relationship between utilisation and the balance between heather and grasses suggested a conservative estimate of 22.5 % utilisation, below which it is expected that heather would be in good condition.

A separate analysis using data from a different grazing experiment[81] allowed for comparison between the two methods of assessing grazing of heather. There is a linear relationship between utilisation and percentage shoots grazed for sheep and deer. For a 1 % increase in the percentage of shoots grazed there is a 0.57 % increase in utilisation. This means that the 33 % threshold equates to 19 % utilisation, close to the suggested conservative estimate of 22.5 % from the experimental data. Consequently, this measure of habitat condition has experimental data to back it up. However, this relationship is based on data from one site, and it may vary depending on the productivity of the heather. If bite depth is constant across sites, then for the same percentage of shoots grazed a higher utilisation would occur if the heather showed lower shoot extension.

- "The majority of cotton grass should be in flower" is also a grazing-related indicator. If a less preferred species such as cotton grass is grazed heavily enough to prevent flowering, this suggests grazing pressure is too high. This is similar to the Herbivore Impact Assessment (HIA) method, where "widespread and abundant flowering" is taken to indicate low grazing impact (MacDonald et al. 1998).
- "The majority of existing heather should be in flower between July and September" is a similar indicator. If grazing is sufficient to remove developing flowers, this again suggests grazing pressure is too high. In HIA methods, "abundant and conspicuous" flowering is also treated as a sign of low impact on dwarf shrub heath (MacDonald et al. 1998).
- "Less than 10% of bog-mosses (*Sphagnum*) should be damaged or dead" reflects trampling pressure and is also taken from CSM guidance.
- "Disturbed bare ground should be less than 10% of the area" is another trampling-related measure, again drawn from CSM guidance.
- "By year 7, the cover of bog-mosses (*Sphagnum*) should be at least 33%" suggests that blanket bog in good condition should contain a strong *Sphagnum* component. This is similar to the HIA criterion that "*Sphagnum* mosses ... extensive and abundant" indicates low grazing impact (MacDonald et al. 1998).
- "At least two dwarf shrub species should be frequent" is similar in intent to the CSM guidance that at least 50% of vegetation cover should consist of at least three indicator species. The underlying idea is that dominance by only one or two species is not ideal. CSM also limits some species from forming more than 75% cover, although it groups ericaceous species together.

How are Indicators of Success assessed in the field?

Indicators of Success are recorded in a similar way to CSM, either by Natural England staff or by ecological consultants working under contract. Initial sample locations should be selected at random, using vegetation maps to avoid bias, and then located in the field using GPS.

At each sample point, a number of attributes are assessed, such as in the blanket bog example, above. Each attribute has a pass or fail target. If any attribute fails at a point, then the whole point fails.

Box C: Are the other Indicators of Success based on similar science?

The remaining Indicators of Success describe blanket bog (in this example) that is in good condition. However, they are best understood as indicators developed from the experience of the authors of the CSM and HIA guidance rather than as independently validated thresholds.

The disturbance indicators can be directly attributed to livestock if away from areas of human disturbance. The flowering indicators are also robust, though it is not known if flowering can be substantially influenced by other environmental factors such as drought.

The quantitative *Sphagnum* target needs more careful contextualisation. Upland systems in the UK are cold and generally nutrient poor, so vegetation changes slowly and targets for improvement need to reflect that. For example, at Moor House, removing sheep grazing in unburned blanket bog plots increased the probability of *Sphagnum* occurrence from around 0.15 to around 0.22 over 60 years[82]. Because the recording method is a precise estimate of cover, a target of 33% may be possible where *Sphagnum* is already well established, but it is likely to be unrealistic where starting cover is low. The target only makes sense if the baseline is known and the expected increase is realistic over the set period, i.e. the timeframe of the agreement.

Similarly, the target that **"two dwarf shrub species must be frequent"** can only be achieved if those species are already present and if grazing management and other environmental factors create conditions where two might thrive. In general, dwarf shrubs increase in cover where grazing pressure is reduced, although at one dry heath experiment (Pakeman et al. 2003), blaeberry achieved the highest cover in winter-grazed treatments at moderate stocking levels (1.64 sheep/ha/yr, or 0.13 LU), possibly because grazing was focused more on winter-green heather.

The information from all points within a vegetation type is then used to make a judgement about the condition of the feature across the site. The CSM guidance states that, as a guideline, if a feature is reported as favourable, it should be possible to say with a high degree of confidence that each target is met across at least 90% of the feature. In one report shared with the project team by Natural England, 22 locations were used to assess the condition of dry heath. To be judged as favourable, all Indicators of Success would need to be passed at 20 of the 22 locations. If only 19 passed, the site would be judged unfavourable. **In practice, favourable condition therefore represents near perfection**. Of note, there were species listed in the Indicators of Success that do not occur in the Lake District.

Natural England states that formal condition reporting is not limited to a simple favourable/ unfavourable binary, and that sites assessed as unfavourable may also be described as recovering, no change, or declining. The field-based assessment material examined so far does not appear to operationalise those subcategories in a way that was visible or meaningful in the report reviewed. The field survey guidance in that material stated that, for a habitat within a geographical site unit to be regarded as favourable, the assessment criteria should be met at 90% of stops, while the results tables were presented through a traffic-light system and defined as 'pass/fail' against favourable condition.

The assessment evidence available so far, and likely to be visible to farmers in agreement discussions, therefore appears to function in practice as a threshold-based judgement of favourable or unfavourable condition, despite Natural England's wider ability to record direction of change within SSSI reporting and habitat surveys. The methodology provided by Natural England for the assessment appears to direct surveyors' attention particularly towards failures, damage and degraded examples. For instance, it asks assessors to highlight 'any failure' to achieve condition targets, to 'clearly explain any failures', to record instances of 'damage', to pay particular attention to grazing pressure, to assess 'degraded/fragmented examples', and to take photographs illustrating 'good' and 'bad' condition. The instructions may risk producing a binary and problem-focused assessment narrative in which failure, damage and grazing pressure are also more visible than partial recovery, baseline improvement, uncertainty, or positive changes and beneficial management already taking place.

Given the rational challenges highlighted here, it is worth restating the main limitations of this approach, as identified in the initial GRNR review:

- A single template for good condition is provided per habitat for that habitat wherever it occurs across the whole of the UK.

- The method focuses on management rather than other factors such as nitrogen deposition or climate change.
- It assumes vegetation can be fitted neatly into a set number of categories.
- There is no benchmarking against more precise methods. The closely related Habitat Impact Assessment methodology[83] uses the same measures to assess the level of grazing on heather, but overestimates damage compared to more precise and physiologically relevant measures of grazing offtake on blanket bog, dry heath and wet heath.[84]
- Condition is judged unfavourable if more than a certain proportion of points fail but this may not reflect improvement over time.
- It is not a method developed for monitoring through time, as the number of categories is too few to get a nuanced view of change and baseline evidence is not used in setting realistic targets.

Assessing the evidence for grazing impacts

Common Standards Monitoring is used across the UK to assess the condition of protected areas. Consequently, it is difficult to see how it might be replaced in the short-term. Long-term this might be an option following NatureScot's decision to update their approach to Herbivore Impact Assessment to put it on a sounder footing.

However, the use of Indicators of Success as a means of assessing progress during an agreement could be enhanced in the following ways:

- CSM guidance and the Indicators of Success are written by ecologists for ecologists. Effort should be made in making them more accessible to the agreement holders, including being shown on the ground what they are and what they show.
- Reports should include information from previous surveys so that long-term change can be assessed. They should not be seen as a one-off assessment.
- Quantitative indicators of success could be based on the potential of the site to change rather than the ideal.
- Map-based outputs are useful to show where points that pass and fail are located. This information is more helpful than plain text reporting. Most helpful would be site visits where farmers went on the hill with the ecologists.

Previous research on HLS agreements[85] indicates that relatively few (22.6%) agreement holders reported regularly referring to their IoS. While just under one third reported not referring to them at all. According to Staley and colleagues "IoS are driven by ecological and environmental science and are not necessarily couched in terms that are familiar and accessible to agreement holders (particularly farming agreement holders). IoS that are more relevant to agreement holders might be more likely to be referred to, understood and monitored on an informal basis in order to inform management adjustments."[86]. In this context it would also be useful to develop socio-economic indicators of success addressing the impact of scheme participation on business viability and resilience.

Measuring success when outcomes depend on more than prescriptions

The discussion above has demonstrated that Indicators of Success and Common Standards Monitoring provide a structured way of judging habitat condition, but they do so through fixed measures that can only capture part of a much more complex ecological reality. This section now turns to the gap between what is prescribed in an agreement and what is actually measured in the field, and the problems this creates when those measurements are used to justify subsequent reductions in stocking rates. In practice, farmers may be asked to respond to indicators that are only partly attributable to their actions, and thus there is a significant mismatch between the prescription-based mechanism used to define actions and pay farmers, and the outcomes-based Indicators of Success used to assess whether the scheme is delivering.

Part 3 of an HLS agreement provides the contracted land manager with "Specific options, prescriptions and Indicators of Success." This part includes:

a) the general conditions on all HLS Land Agreements, and
b) for each option:
   I. A General Description of the management required,
   II. Indicators of Success, and
   III. Management prescriptions: the dos and don'ts of management.

The following case study, drawn from option HC16, Restoration of successional areas and scrub, illustrates

this structure in practice. It shows how a prescription-based agreement sets out a series of required management actions alongside outcome-focused Indicators of Success, and it therefore provides a useful example for examining the relationship between what the agreement asks the farmer to do, what it expects the habitat to look like at review, and where tensions may arise between the two.

Indicators and Prescriptions: A Case Study

The following is an example of the option components for a Higher-Level Stewardship option from a Lakeland agreement, HC16: Restoration of successional areas and scrub.

General description of the management required:

The aim of this option is to maintain habitat mosaics at the field and landscape scale for specific BAP species and to protect soils and watercourses. It is also suitable adjacent to woodland to enhance or maintain the quality of the woodland edge environment and to maintain scrub on limestone pavement. This option is not appropriate on archaeological sites, or where scrub will be detrimental to the landscape. The option will require some form of regular management of vegetation, such as extensive grazing, on part or all of the site to maintain suitable conditions for species and to prevent the development of woodland. The option may require the exclusion of livestock in some or all years.

Indicators of Success

- By year 10, the following desirable species including trees and shrub dwelling birds should be present.
    - By year 10, cover of shrub species Juniper / Box / Hawthorn / Blackthorn / Hazel / Willow / Rowan should be between 20% and 50% of the area. The vegetation within 2m of the edge of the scrub should be taller than 30cm.
    - By year 10, shrub species should have a diverse age and height structure. No more than 50% of the scrub area should be mature, or over mature.
    - By year 10, tree species Birch / Ash / Oak should be present at irregular spacings, with an overall canopy of between 5 - 10% of the area.
    - By year 3, grasses and wildflowers including Heather should be between 5cm and 15cm tall on 30% to 60% of the area. From 1st May until

Box D: Prescriptions, indicators, and the problem of attribution

The example here demonstrates a clear tension between prescription and outcome. The farmer is required to follow a fixed set of rules and restrictions, while the Indicators of Success assume that those actions will produce particular habitat outcomes. In reality, those outcomes may vary substantially depending on factors that are outside the farmer's control. More broadly, one of the main criticisms of prescription-based approaches is that they can require agreement holders to accept that a desired ecological outcome may not follow, even when the prescribed management has been followed exactly.

The option's prescriptions and its Indicators of Success therefore sit uneasily alongside one another. The prescriptions largely work through exclusion and restraint: livestock are excluded, cutting is prohibited, fertiliser and supplementary feeding are banned, drainage must not be altered, and vegetation control is tightly regulated. Yet the Indicators of Success expect a positive and quite specific ecological trajectory: scrub should establish and diversify, trees should appear at irregular spacings, shrub cover should reach a defined range, grasses and heather should remain within a particular height band, and the site should move into a recovering condition. The problem is that several of these outcomes are not directly created by the prescriptions alone. For example, excluding livestock may help shrubs establish in some places, but it does not by itself guarantee the right balance of canopy, ground layer height, flowering, or species composition across a site. Likewise, banning drainage, cultivation and feeding may prevent damage, but it does not actively produce the structural and compositional changes that the Indicators of Success require.

This creates a mismatch between what the action enables and what the outcome expects. The prescribed actions are mostly negative rules that remove pressures, whereas the indicators are positive ecological targets that assume a particular response will follow within a fixed timescale. That assumption is difficult to justify because habitat change is shaped not only by management, but also by local soils, exposure, hydrology, seed supply, browsing pressure, weeds, historic condition, and broader environmental change. In practice, this means a farmer can comply with the prescription yet still fail to meet the indicator if the site does not respond as expected. The result is that stock reductions or other management changes may be treated as though they should produce predictable habitat recovery, even though the agreement itself does not fully control the ecological processes needed to deliver that outcome.

30th July, these plants should be flowering and setting seed.

- By year 2, the following undesirable species Ragwort / Creeping Thistle should be no more than occasional.
- All SSSI land should be in recovering condition.

Management Prescriptions; the dos and don'ts of management

The following rules apply across the whole area being managed under this option.

- Do not cut the grass sward between years 1 and 10.
- Exclude livestock between years 1 and 10.
- Do not apply fertilisers, organic manures or waste materials (including sewage sludge) unless specifically agreed in writing with your Natural England adviser and / or stated in a management plan / capital works programme.
- Supplementary feeding is not permitted.
- Control all conifers / Poplar / Sycamore / Rhododendron / Japanese Knotweed.
- Unless otherwise agreed with your Natural England adviser, all mature or over-mature standing trees and all standing and fallen deadwood must be retained, unless it is a genuine safety hazard. Tree surgery must be limited to that required for the safety of people and livestock.
- Ensure the establishment and maintenance of trees, shrubs and field layer by controlling pest species with methods agreed with your Natural England adviser.
- There must be no ploughing or other cultivation such as reseeding, rolling or chain harrowing unless these are required to establish trees and shrubs and agreed with your Natural England adviser / specifically stated in the prescriptions or in the management plan / capital works programme.
- There must be no new drainage or modification/ improvement to existing drainage systems. Existing drains can be maintained.

Section Summary

Stocking rate evidence used during HLS rollovers in the Lake District has been generated largely through the application of Indicators of Success and Common Standards Monitoring. While some indicators such as the heather shoot grazing threshold are supported by experimental data, others are based on expert judgement rather than validated ecological thresholds.

As a result, the evidence base used to assess stocking impacts is uneven, combining robust measures with others that are more interpretive and sensitive to site specific conditions.

The interpretation of this evidence on the ground is shaped by the pass/fail structure of CSM, which recognises whether sites meet predefined end state conditions, rather than if the habitat is making progress in a positive direction. This tension creates difficulties where ecological processes respond slowly or are influenced by factors outside farmers' control, as some of the evidence summarised in section one has shown. Stocking rate adjustments may therefore be justified on the basis of indicators that do not reliably reflect either management effort or realistic ecological potential.

These issues highlight deeper and much broader tensions within HLS agreements which are not specific to the Lake District, where prescriptions, indicators and monitoring measures are not always aligned. Prescriptions often require restrictive or passive management, whereas Indicators of Success assume active, predictable habitat recovery within fixed timescales. This mismatch means that farmers can comply fully with the agreement yet still fail indicators, and condition assessments, **emphasising the need for approaches that recognise progress, incorporate realistic ecological trajectories, and better connect management actions with expected outcomes.**

3. What immediate improvements to data-sharing and agreement negotiation processes would most increase confidence in decision-making for the Lake District fells?

It has not been possible to explore this question in full. However, approaches used elsewhere for the enhancement of upland and other land for delivering ecosystem services (public goods) alongside agricultural production, which could be considered for the Lake District fells are described below.

Some recommendations in this review concern practices that may be within the influence of local Natural England advisers, such as communication (especially active listening and addressing farmer concerns), clear and thorough paper-based summaries of negotiations, explanations of evidence and sharing

of site-specific monitoring where available. Others, including payment design, hybrid payment models, national scheme rules, compliance systems and the resourcing of monitoring and advisory capacity, sit primarily with national Natural England teams, Defra or RPA. The recommendations should therefore be read as identifying improvements required across the wider delivery system, rather than as implying that all changes are within the gift of local NE staff.

Potential future approaches to align measured outcomes with payment for outcomes.

The Payment-by-Results approach (also called results-based payments) rewards land managers based on the *ecological outcomes they achieve* rather than specific prescribed actions. In upland habitats across Europe, such as peatlands, heathlands, and species-rich grasslands, this model has gained attention as an alternative to traditional agri-environment schemes. As with all things however, the approach has pros and cons.

The positives from taking a pay-by-results approach include:

- It provides a focus on real environmental outcomes. Payments are tied directly to measurable improvements (e.g. vegetation diversity, peat condition bird populations) and it encourages meaningful habitat recovery rather than "box-ticking" compliance.
- It provides flexibility for land managers. Farmers and landowners can choose how best to achieve results based on local knowledge. Hence it can potentially be particularly valuable in uplands where conditions vary widely (e.g. soil, weather and grazing pressure).
- It encourages innovation in that it incentivises creative and adaptive management strategies and can lead to more efficient or locally tailored solutions than rigid prescriptions.
- It encourages improved engagement and ownership. Participants often feel more responsible for outcomes, increasing motivation, and it builds ecological understanding among farmers.
- It has the potential to deliver better value for money, in that public funds are spent on demonstrable environmental gains rather than actions with uncertain impact.

However, the disadvantages associated with the pay-by-results approach include:

- It introduces uncertainty and financial risk. Attaining the results depend on factors beyond farmer control (e.g. weather, wildfire and pests) and income becomes less predictable, which can discourage participation.
- It requires robust, often costly systems to measure ecological outcomes reliably and the indicators involved (e.g. plant species composition) can be difficult to assess consistently.
- There can be a substantial time lag before results are visible. Upland habitats (especially peatlands) can take years or decades to show improvement. As a result, farmers may not be rewarded in the short term.
- It introduces the potential for inequity. Land with higher natural potential may achieve results more easily, leading to uneven payments. Less productive or degraded areas may struggle to qualify despite the efforts made to improve these.
- It requires substantial knowledge and support. Farmers may need training in ecological assessment and adaptive management and without adequate advisory support, outcomes may be inconsistent.

Pay-by-results schemes can deliver more effective and locally adapted conservation outcomes in European uplands, but they come with higher uncertainty, monitoring challenges, and equity concerns. In practice, the use of hybrid schemes, combining base payments for actions with bonuses for results, may balance risk and effectiveness.[87]

Any case for introducing a pay-by-results approach in the uplands of the Lake District should consider the lessons learned from previous approaches applied to upland or high nature value systems in the UK and EU.

- A Results-Based Agri-environment Payment Scheme (RBAPS) pilot was trialled in Wensleydale in the Yorkshire Dales between 2016 and 2018, with a focus on species-rich hay meadows and upland grasslands[88]. Farmers were paid based on ecological condition, not prescribed action and habitat quality (e.g. plant diversity, structure) determined payment level. The farmers had full flexibility in deciding the management to apply. The pilot demonstrated that outcome-based payments can motivate better habitat quality than traditional schemes. It also tested farmer self-assessment, cost-effectiveness, and monitoring

approaches and was used to help inform the design of England's Environmental Land Management (ELM) schemes.

- The Burren Programme, focused on 30,000 ha of Species-rich limestone grasslands in Ireland is regarded as a flagship EU example[89]. It was based on a hybrid pay-by-results approach, where an annual habitat quality score (0–10) determined payment, additional funding was provided for conservation works and the indicators used included grazing level, scrub, erosion, and species richness. The approach has driven proven positive biodiversity impact and strong value for money over multiple years. It achieved high farmer engagement due to flexibility and local tailoring of the approach and is widely regarded as a benchmark model for Europe. The ACRES Burren–Aran schemes is an ACRES Co-operation Project; a successor scheme building out from the original Burren programme and shows how pay by-results approaches are being scaled into mainstream policy[90].
- The ACRES Co-operation approach in Ireland provides a landscape-scale, results-based model for agri-environment delivery, operating across defined high-priority zones and supported by locally based Co-operation Project (CP) Teams. These teams work with farmers, advisors, and state agencies to co-develop and implement locally tailored action plans that combine farm-level management with coordinated landscape actions, such as scrub control and water quality improvements. Payments are linked directly to environmental outcomes through a scoring system that assesses habitat quality at field or commonage level, while additional funding supports targeted investments and collaborative actions. The ACRES-CP approach integrates farmer flexibility with structured local coordination, enabling collective management of shared resources and commonages, and fostering joint responsibility for delivering ecosystem services across the wider landscape.[91]
- The Sustainable Uplands Agri-environment Scheme (SUAS) in Ireland was an EU EIP-AGRI pilot focused on common land (commonage) in the Wicklow Mountains[92]. It is regarded as one of the clearest upland-specific EU pilots, especially for common grazing systems. Farmers formed groups and developed joint management plans which combined habitat improvement actions and moved towards a results-based payment model. The scheme covered 7,126 ha and 84 farmers and improved habitat condition through grazing management, scrub control and restoration works. It is considered to have built farmer capacity and ownership, shifting attitudes toward ecosystem service delivery.

These examples emphasise that what works well in practice is having locally adapted scoring systems. In addition, hybrid models (actions + results) help manage farmer risk and strong advisory support and farmer training improves outcomes (e.g. in SUAS). However, there were also challenges given that monitoring ecological condition is resource-intensive and results can vary with weather and site condition, affecting income stability for the farmers involved.

Nevertheless, the key premise of pay-by-results approaches (better ecological outcomes and farmer engagement) is *strongly supported by evidence from these examples.* The biggest real-world constraints are monitoring complexity, income risk and the need for advisory support. That is why the most successful schemes (especially the Burren Programme) use hybrid models, combining base payments (providing security) and results-based bonuses (providing incentives).

On large Lake District commons, tools such as fencing, shepherding, habitat-zone stocking and annual stocking adjustment may be constrained by landscape acceptability, labour, flock age structure, commons governance and transaction costs. These tools should therefore be treated as options for site-specific discussion rather than generic short-term recommendations.

Recommendations for next steps towards increased confidence in decision-making for the Lake District fells

There are several approaches for practical improvements to both data-sharing and agreement-negotiation processes. The central issue is two-way communication rather than decisions and guidance being perceived as coming primarily from Natural England. A key success of many of the 'payment by results' schemes has been the autonomy of farmers in adopting approaches that they believe will provide the desired outcomes and in monitoring their own progress towards their goals. Farmers have also

highlighted the need for site-based assessments of likely improvement to contextualise their efforts and makes goals achievable.[93]

A central issue in the Lake District fells, as elsewhere, is that much of the existing guidance, particularly CSM materials and Indicators of Success, have been written by ecologists for ecologists. Making these materials more accessible, using clearer language and formats suited to agreement holders, would help ensure that farmers, commoners and other stakeholders can genuinely understand the basis for decisions affecting their land. Annexes included in the GRNR report described CSM, summarised habitat categories and included recording sheets but it is unlikely that land managers would have found these easy to understand even if they had time to read through them.

Better integration of information over time is also essential. Agreements and monitoring reports should routinely include data from previous surveys so that long-term ecological change at sites is visible rather than treated as a series of isolated, one-off assessments. Indicators of success would be more meaningful if they reflected what improvement is realistically possible given site baseline conditions, rather than measuring progress solely against ideal conditions that may not be attainable in the lifetime of a 10-year agreement, if ever.

Final Recommendations

Possible short-term approaches

- Indicators of Success are a measure of whether the desired vegetation condition has been reached but provides no indication of progress towards it. Indicators of Progress would be better.
- Farmers and ecologists should work together towards basic templates for outcomes which show progress for the SSSI's and habitats in the Lake District fells relevant at a site level. These should be clear to both farmers and ecologists and achievable within the context of the site.
- Agreements should build on and link to previous assessments and management in a clear and obvious way showing adaptation to previous outcomes and reassessments of outcomes as appropriate at the site level.
- Map-based outputs and as far as possible, site visits, to highlight sites which need improvement or are already in good condition will improve clarity for farmers around management approaches.
- In particular, there needs to be much more regular and clearer face-to-face communication between farmers and ecologists to ensure that:
  a) farmers are aware of what is being asked of them, what condition habitats are currently in and what the desired habitat condition looks like in practice, and
  b) ecologists take account of and work with farmers' knowledge around local constraints (e.g. topography, soil, weather, type/condition of other vegetation occurring in association with the target habitats) and how they are impacting on livestock grazing regimes.

Longer-term approaches

- High level (open) data on agreements and monitoring across the Lake District fells could be provided to farmers and commoners to help build trust in decision making and for comparison with their own agreements.
- Better and more open and accessible data across all agreements. Carefully redacted but more open data on agreements, their stocking rates and indicators of success will help discussion about what works. This will need to include documentation of any informal data used in decision making.
- Longer term consideration of appropriate and achievable monitoring approaches for measuring progress towards favourable condition would be valuable, e.g., considering; farmer inputs and better documentation of informal monitoring approaches to align with formal monitoring.
- It is essential to consider how stocking rates link to both the maintenance and success of farming and in particular, hefting practices on commons, in the Lake District World Heritage site, as well as to the ecological condition of designated features. Grazing livestock are key to maintaining many of the habitats in the Lake District, but the extent to which the sheep numbers required to maintain an effective hefting system and economically sustainable farms in the Lake District can be balanced against achieving favourable condition for all habitats is unknown. It is possible that compromises may be needed depending on priorities for this landscape, which current

assessment methods do not effectively acknowledge or allow for.

Conclusion

This evidence review has examined the empirical basis and application of the grazing recommendations contained in GRNR, and considered how stocking rate decisions have been generated, interpreted and implemented during Higher Level Stewardship rollovers in the Lake District. The review demonstrates that while GRNR reflects extensive local ecological experience and long-term observation, the stocking rate of 0.5 ewes per hectare should not be understood as a scientifically robust or universally applicable threshold across the Lake District fells.

Rather it is a pragmatic annual average local reference point / commonly recommended maximum annual average in some rollover contexts, which includes followers and is subject to site-specific assessment.

Moreover, the review found limited published experimental evidence capable of validating 0.5 ewes/ha as a robust universal threshold. Neither has it identified scientifically validated examples from the Lake District High Fell where annual average sheep stocking at or above 0.6 ewes/ha, including normal followers, has demonstrably delivered good recovery of the relevant designated habitats. We have found no evidence that scientific monitoring has taken place to test whether habitat recovery at or above 0.6 ewes/ha can be achieved. The critique is therefore about how a 0.5 ewes/ha reference point is evidenced, communicated and applied, *not* a claim that higher annual average stocking rates are generally compatible with nature recovery. Further collaborative monitoring and potentially robust, experimental research, working with farmers, may be needed to scientifically validate the impact of varied stocking rates *in situ* over a longer term on the Lakeland High Fells.

Wider habitat-relevant scientific literature from the UK and Europe consistently shows that upland ecological outcomes depend on multiple interacting drivers including vegetation type, nitrogen deposition, historic management, climate change, grazing timing and spatial patterns, determining that stocking rate alone cannot reliably predict habitat recovery.

The review highlights that current agreement processes rely on Indicators of Success and Common Standards Monitoring to assess habitat condition. Some indicators, such as thresholds for heather grazing, are grounded in experimental evidence, while others are based more strongly on expert judgement and idealised end-state conditions. The pass/fail nature of this system means that ecological progress over time is often not well captured, and agreement holders may be required to respond to outcomes influenced by factors beyond their direct control. This can undermine confidence in decision-making, particularly where prescribed actions are followed but expected ecological responses do not materialise within fixed timeframes.

Due to time constraints and limitations in access to agreement-level data, this review was not able to examine a comprehensive set of case study agreements as originally intended. In particular, there was insufficient scope to systematically compare how evidence relating to stocking rates and Indicators of Success has been interpreted, applied, and administered across different agreements, both at their inception and through subsequent rollover phases. Addressing this gap would be a valuable next step. A more detailed, comparative analysis, undertaken collaboratively with Natural England and local land managers, would help to better understand variation in practice, improve transparency in how evidence is used, and support the development of more consistent and context-sensitive approaches to agreement design and implementation.

The evidence reviewed here does not suggest that grazing reductions are irrelevant or unnecessary, but reinforces the importance of treating stocking levels as part of a wider, adaptive management framework that is sensitive to habitat mosaics, seasonal constraints and farm-system realities. The Lake District is a living cultural landscape, where ecological condition, farm viability and the maintenance of traditional hefting systems are deeply interconnected. Stocking rate decisions that do not adequately consider the social, economic and practical dimensions of fell farming risk being neither ecologically effective nor sustainable in the long term.

The review also identifies clear and achievable opportunities to improve confidence, transparency and outcomes without requiring wholesale change to existing systems in the short term. These include clearer, more accessible communication of monitoring criteria; better integration of baseline data and repeat

monitoring to demonstrate direction of travel; greater use of map-based outputs and site visits; and more structured opportunities for farmers' local knowledge to inform ecological interpretation. Over the longer term, there is strong evidence from the UK and Europe that more flexible, outcomes-oriented or hybrid payment approaches can strengthen engagement, foster shared ownership of goals and deliver meaningful ecological gains when supported by adequate advisory capacity.

The findings of this review do not point to an impasse, but to a constructive path forward. By shifting the emphasis from fixed prescriptions towards measurable progress, from closed decision-making towards shared evidence, and from single metrics towards adaptive, site-specific approaches, it is possible to reconcile nature recovery with the continuation of viable hill farming.

The Lake District's high fells have been shaped through centuries of interaction between people, livestock and landscape. Building future grazing policy on that same principle of integration, ecological, social and economic, offers the most hopeful route to maintaining both biodiversity and the living cultural heritage on which this World Heritage landscape depends.

Position and funding statement

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